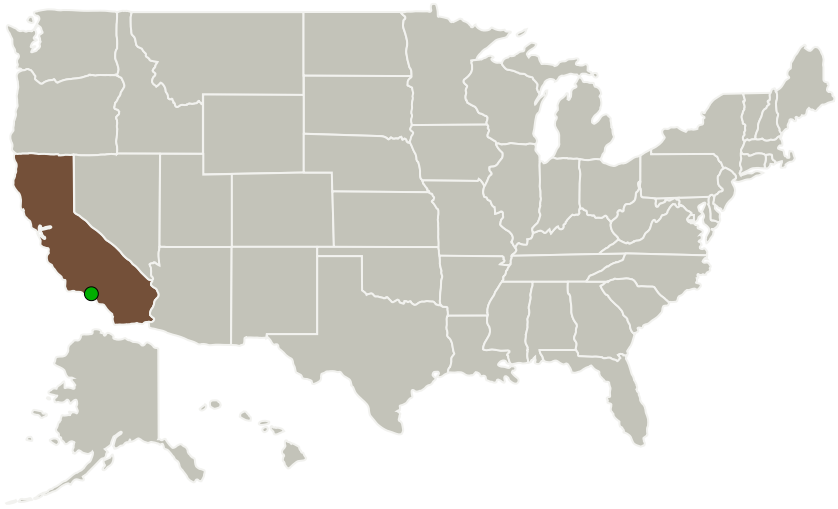
Tunable, High-Power Terahertz Quantum Cascade Laser Local Oscillator, Phase I

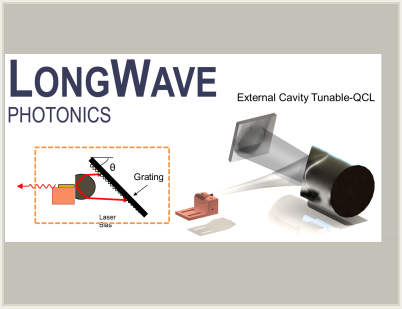
Completed Technology Project (2017 - 2017)

Project Introduction

NASA and NASA funded missions/instruments such as Aura/MLS (Microwave Limb Sounder), SOFIA/GREAT and STO/STO-2 have demonstrated the need for local oscillator (LO) sources between 30 and 300 um (1 and 10 THz). For observations >2 THz, technologically mature microwave sources typically have microwatt power levels which are insufficient to act as LOs for a heterodyne receivers. LongWave Photonics is proposing to develop a high power, frequency tunable, phase/frequency-locked, single mode, External Cavity THz quantum cascade laser (ECT-QCL) system with >2 mW average power output and a clear path to increase the power to >10 mW. The system includes a THz QC gain chip based on SISP or metal-meal waveguide with integrated horn or lens structure to reduce facet reflectivity. Frequency selective external feedback will be frequency tunable over 100's of GHz, with center frequencies ranging from 2 to 5 THz. The gain chip will be packaged in a high-reliability Stirling cycle cooler. The source will be phase/frequency locked to a stable microwave reference synthesizer with <100 kHz line width.

Primary U.S. Work Locations and Key Partners





Tunable, High-Power Terahertz Quantum Cascade Laser Local Oscillator, Phase I Briefing Chart Image

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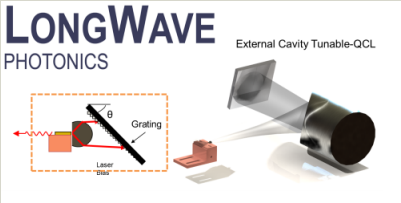
Organizations Performing Work	Role	Type	Location
LongWave Photonics, LLC	Lead Organization	Industry	Mountain View, California
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations
California

Images



Briefing Chart Image
Tunable, High-Power Terahertz Quantum Cascade Laser Local Oscillator, Phase I Briefing Chart Image
(https://techport.nasa.gov/image/127834)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
LongWave Photonics, LLC

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

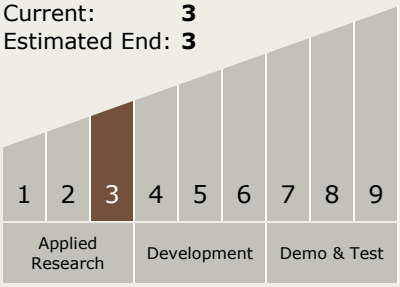
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Tsungyu Kao

Technology Maturity (TRL)

Start: **3**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.3 Optical Components